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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/696,955 | 10/27/2000 | Kazuyoshi Tamura | 107703 | 3185 |

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EXAMINER

ANDERSON, MATTHEW A

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 09/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/696,955

Applicant(s)

TAMURA ET AL.

Examiner

Matthew A. Anderson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3 and 5 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3 and 5 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 December 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1,3,5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ke et al. (US 6,284,093 B1) in view of Wolf et al. (Vol. 1 pp. 8, 23-27, 32-33, 59, 1986) and Tamatsuka et al. (US 6,299,982 B1).

Ke et al. discloses a non-dielectric ring which surrounds a workpiece wafer in a plasma semiconductor processing chamber. The ring is disclosed as consisting of Si of the single crystal variety in col. 6 lines 31-38. In col. 14 lines 66+ and col. 15 lines 1-10 the cylindrically symmetrical nature of the ring with respect to the wafer axis is disclosed.

Ke et al. does not disclose the oxygen or nitrogen concentration in the ring or the method of forming the ring.

Wolf et al. discloses known single crystal Si processing methods. Cz silicon was shown on page 8 to be well known. On page 23 -25 disclose methods of forming wafers. Etching of the surface to remove contamination and damage from metal working is also disclosed. Etching of On page 32 is disclosed the incorporation of

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oxygen and nitrogen into Cz silicon to increase the warpage resistance of the Si. This warpage resistance would be of great value in a batch processing chamber such as that described by Ke et al. In pages 531-532, acidic and alkaline etchants are described including aqueous mixtures of HNO_3 , HF, Acetic Acid (CH_3COOH) and KOH /isopropyl alcohol. Water is described as a common diluent for etchants. On page 59, in the first paragraph, it is related that interstitial oxygen forms oxygen precipitates in Cz-Si which contribute to "the basis for intrinsic gettering"

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine Ke et al. and Wolf et al. because Ke et al. discloses Si mono-crystalline focus rings and Wolf et al. discloses known ways of working with and improving the warpage resistance of items formed from such Si.

The combination does not specify a ring with certain atomic concentrations of oxygen or nitrogen.

Tamatsuka et al. discloses Si wafers made from a Cz Si ingot which has nitrogen concentration of 1×10^{10} atoms/cm³ to 5×10^{15} atoms/cm³ and a oxygen concentration of 1×10^{18} atoms/cm³.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the Si of Tamatsuka with the previous combination because Wolf et al. discloses the superior warpage resistance of Si doped with oxygen and nitrogen.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to form a monocrystalline Si focus ring with a nitrogen concentration

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of 5×10^{13} atoms/cm³ to 5×10^{15} atoms/cm³ and a oxygen concentration of 5×10^{17} atoms/cm³ to 1.5×10^{18} atoms/cm³ because Si rings were known, such doping concentration of N and O was known for Si, and it was known that N and O increased the warpage resistance of Si. The intrinsic gettering property of Si with oxygen versus Si with low amounts of oxygen was also obvious to those of ordinary skill in the art as described by Wolf et al on page 59.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to etch the surface of the focus ring with either acidic or alkaline etchants because etching the surface of Si to remove processing damage and contamination was known to Wolf et al.

As far as the process for the production of the focus ring, it would have been obvious to one of ordinary skill in the art at the time of the present invention to form a ring from Cz monocrystalline Si because Ke et al. discloses such a shape, Wolf et al. discloses metalworking of Si, Tamatsuka et al. discloses Si with such doping concentrations and one of ordinary skill in the art would have been able to bore a hole thus producing a ring as in Ke et al.

Response to Arguments

3. Applicant's arguments filed 7/17/2003 have been fully considered but they are not persuasive.

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The applicant's argument that Ke combined does not suggest every aspect of the applicant's claim is noted but is not convincing. Ke uses a pure Si focus ring. Wolf et al. discloses known methods of producing Si in shapes having a round outer perimeter (i.e. a ring). Wolf et al. also discloses the oxygen concentrations of grown single-crystal Si which is in the range claimed by the applicants. The examiner must infer from this evidence that one of ordinary skill in the art would have found it obvious that Si pure enough for forming semiconductor wafers and devices thereon is pure enough to form a focus ring used in a semiconductor wafer etching chamber. This is so because Ke et al. uses the Si focus ring for holding semiconducting Si wafers (see col. 3 lines 10-20). Additionally, the gettering ability of oxygen concentrations in Cz-Si within the applicant's claimed range were given by Wolf et al. forming the basis of the industry standard intrinsic gettering (page 59). Nitrogen was known to have a warpage resistant effect.

The argument against Tamatsuka et al. is not persuasive. Tamatsuka et al. merely shows common oxygen and nitrogen concentrations known in Cz silicon. Since Ke uses Si for the focus ring, the values of Tamatsuka are very applicable in that they show semiconducting grade single crystal Si concentrations.

The argument that there is no motivation to combine Ke, Wolf and Tamatsuka is not persuasive. The examiner gave the motivation for combination above to be lowered warpage. Since the ring is used in a structure capacity, lowered warpage would have been to those of ordinary skill to be desirable.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., improved gettering) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Wolf et al. discloses that oxygen in Si forms the basis for intrinsic gettering.

In response to the argument that the combination is unreasonable is not convincing. The combined references at least suggest the Si material of the applicant. Ke uses a single crystal Si which, by Wolf et al. and Tamatsuka, can have both a gettering effect and a warpage resistive effect.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew A. Anderson whose telephone number is (703) 308-0086. The examiner can normally be reached on M-Th, 6:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (703) 305-2667. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

MAA

September 29, 2003